

TO: Gary Dinkel, USGS Facilities Engineer

FROM: Robin G. Hermanson, Facility Engineer

DATE: June 18, 1997

SUBJECT: Solar Hot Water Heating System

In order to repair the solar hot water heating system it would require 450 feet of silicone heater hose at a cost of \$1,710. Therefore, we need to ask the question, "Will the repairs which need to be made on the solar system be paid back by the savings since the Photo Lab is operating at a reduced level compared to previous years?"

To give you some history on the solar hot water heating system, the system came to us in the form of grant money to use for solar energy. It was constructed in 1979 for a cost of \$585,000. We in maintenance did not support the idea of heating with solar because of the long payback (a heat pump between the wash water and incoming water would have a five year payback). For many years the solar system provided 50% of the hot water in the winter and 100% of the hot water in the summer. With the Photo Lab at full production the system would operate at a COP of 10. COP is the ratio of input energy to output energy. The savings were consistently \$20,000 a year and maintenance costs were \$1,000 - \$2,000 per year.

To put that in perspective with other energy costs, following are equivalent costs of five types of energy per 100,000 BTUH which is equal to one therm:

- Electricity at \$.035 per KWH is equal to \$1.02 per therm
Subtracting the demand charge, it is equal to \$.73 per therm
- #2 fuel oil at \$.74 per gallon with 83% efficiency is equal to \$.62 per therm
- Natural gas at \$.383 per CCF therm at 80% efficiency is equal to \$.48 per therm
- Solar full usage \$.10 per therm COP 10
Present usage \$.33 per therm COP 3
- Heat Recovery \$.33 per therm COP 3

Three years ago Don Lauer asked if the solar system had out lived its usefulness. At the time it was saving \$20,000 a year. Now, with the Photo Lab currently using about

60,000 gallons of hot water a month, the potential yearly hot water savings is \$4,000 per year. The solar system could provide 90% of the hot water needs, but the repairs are costly. Besides the heater hose, some other repairs that are a possibility are underground piping, heat exchanger, and pump seals which are hard to predict. Also, the pedestals could use paint.

Another consideration is if the Data Center gets natural gas the new equipment would initially be low maintenance. Although the cost of heating with natural gas is higher than heat recovery or solar energy, it is one-half the cost of heating with electricity.

Some other questions to ask are:

1. Is the area that the solar system is located on needed for parking?
2. Will the production of the Photo Lab be further reduced?
3. Will natural gas be purchased and stay at \$.48 per therm?

If the answer is yes to any of the above questions, we recommend the solar system be discontinued and removed.

Robin G. Hermanson